The Report Committee for James McDuffie Bruce IV
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Local Micromobility Regulations: Implications for Equity and Data Privacy in Four U.S. Cities

APPROVED BY
SUPERVISING COMMITTEE:

Gian-Claudia Sciara, Supervisor

Andrea Gold

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by

James McDuffie Bruce IV

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Abstract

Local Micromobility Regulations: Implications for Equity and Data Privacy in Four U.S. Cities

James McDuffie Bruce IV, M.S.C.R.P.

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Supervisor: Gian-Claudia Sciara,

Since September 2017 a growing number of shared micromobility companies such as Bird and Lime have been operating in over 100 American cities. Shared use micromobility devices, commonly referred to as shared e-bikes and e-scooters, have invaded cities, forcing regulators and policy makers into action as they create rules and regulations to control these devices on public streets. This report will explore micromobility regulations in four cities across the United States including Seattle, Washington, Chicago, Illinois, Austin, Texas, and Miami, Florida for the purpose of understanding how each city addresses the issues of equity and data privacy within their regulations and requirements in order to distill key observations for other regulators as they craft their own micromobility policies and vendor requirements.

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Chapter 1: Introduction

Since September 2017 a growing number of shared micromobility companies such as Bird and Lime have begun operating in over 100 American cities. The National Association of Transportation Officials (NACTO) defines shared micromobility as "shared-use fleets of small, fully or partially human-powered vehicles such as bikes, e-bikes and e-scooters" (National Association of Transportation Officials, 2018). Use of the small transportation devices, especially e-scooters, is growing exponentially. According to a National League of Cities report, 35 million trips were taken on micromobility modes (docked and dockless bikeshare systems) in 2017. When e-scooters were introduced in several American cities in 2018, micromobility trips more than doubled in one year, with cities reporting 84 million trips (Griess, 2019). These new services are attractive to potential users and cities alike. For users, the ability to schedule travel quickly using a cell phone provides convenience and efficiency, and flexible pick-up and drop-off zones make starting and ending trips easy (Greiss, 2019). For cities, micromobility offers a potential solution to addressing mobility deserts, "by closing 'first and last mile' gaps for transit systems, opening access to underserved populations, and significantly broadening the pedestrian shed," the distance the average resident is willing to travel to reach a transit stop (Griess, 2019). If individuals begin replacing more car trips with micromobility trips and if the average lifespan of scooters increases, then other societal benefits could include reductions in carbon emissions and traffic congestion, and better air quality in urban areas (Moreau, 2020). There are, however, some new

challenges cities will face as they adopt micromobility into their existing transportation networks and facilities.

These services pose some challenges for cities in addition to the benefits referenced above. Residents and business owners often complain that the devices are parked improperly, blocking sidewalk paths, access points, and loading zones or are discarded carelessly on private property. This challenge disproportionately affects people who travel in a wheelchair and are less able to navigate an obstruction on a sidewalk or street. Parking enforcement is a challenge for cities, because with a dockless system, it can be difficult to locate devices that are not parked safely (Griess, 2019). Cities have responded to these issues by creating and implementing new systems of enforcement and regulation in order to ensure safety, but challenges persist. Cities also struggle to marry strong regulations and new enforcement practices in order to achieve a more equitable distribution of scooter fleets across various demographics like race, age, and gender within the city. The issue of inequitable access to docked bikeshare systems is well studied and reveals stark disparities in accessibility. For example, a McGill University study found that New York's CitiBike system only reached 15.9% of New Yorkers living in poverty and only 16.5% of New Yorkers of color (Basalaev-Binder, 2019). More research is necessary to evaluate the accessibility of dockless systems.

Cities have also struggled to build their internal capacity to collect, store, and share data safely while protecting the privacy of micromobility riders. Micromobility platforms and the mobile applications customers use to access them produce a steady

flow of data-- including geolocation data, trip data, speed, credit card information--to the micromobility vendor. Many local transportation or information departments in turn receive the plentiful and sensitive data from micromobility operators; cities use these data for enforcement and planning, but must protect user privacy in the process or risk eroding the public's trust and their partnerships with micromobility vendors. In 2018 only eight US cities had robust data privacy programs or employed a chief privacy officer (GovTech, 2018). Urban transportation equity and data privacy issues have been studied by practitioners and academics alike.

In political scientist, Robert Bullard's, article *Addressing Urban Transportation Equity in the United* States, he shows how urban transportation systems in the United States do not serve everyone equally. There are a number of reasons for this inequality. One reason is the unequal federal and state funding allocation for certain transportation systems and modes. For example, states typically spend less than 20 percent of federal transportation funding on public transit, while 54 percent of urban transit users in the US are African Americans and Latinos (Bullard, 2004). Bullard identifies three categories of transportation inequity including: procedural, geographic, and social. When applied to micromobility, Bullard's framing of social equity is useful. He writes, "Transportation *benefits* and *burdens* are not randomly distributed across population groups"; instead, the benefits typically fall to the wealthy and more educated while the burdens fall to people of color and low-income people (Bullard, 2004). As new micromoblity modes proliferate

in American cities, it is important to recognize that the geographic and social inequities Bullard describes applies to them too.

Most e-scooter providers deployments their fleets largely in dense, downtown businesses centers or tourism districts, where mostly wealthy white-collar workers and residents are concentrated; such practices reveal both the spatial inequity (concentrated deployment in dense centers) and social inequity (service more accessible to wealthy professionals) of micromobility systems. The significant burdens that e-scooter adoption brings into cities include the obstruction of sidewalks, bike lanes, and travel lanes and sidewalk crowding. These challenges disproportionately populations with ambulatory, visual, and auditory impairments. Cities that choose to can use their regulating authority to lessen these burdens by instituting strategic rebalancing requirements, parking restrictions, and benchmarks. They can also institute policies which force companies to consider expanding access to services to populations who are unbanked or do not have access to a smartphone. Designing regulations to achieve outcomes such as increased access for marginalized groups and clearer sidewalks for all pedestrians will improve the equity of the micromobility systems and the cities' transportation network overall.

Just as cities are grappling with social and spatial equity implications as they adopt new micromobility systems, they are also grappling with how to collect, store, and protect the data these systems produce in order to better regulate vendors and plan for the future. Planning scholar Lisa Schweitzer argues in "Four Reasons Why AICP Needs an Open Data Ethic" that "Urban informatics may be less visible than streets, design,

amenities, and other things for which planners set standards, but they have no less impact" (Schweitzer, 2017). In other words, the setting of standards that planners and city officials will follow to collect, store, and work with data is vital for their ability to govern in the public interest. Some cities have elected to use the open source data specification created by the Los Angeles Department of Transportation called the Mobility Data Specification (MDS). This specification is appropriate for cities who have a privacy program in place and resources to safely collect and store geolocation data, however most American cities do not have this capacity. Policy transparency and principle-based privacy programs are necessary to earn the public's trust. Pew reports that 78 percent of U.S. adults feel "They have very little/no understanding about what the government does with the data collected" while 66 percent say "the potential risks of the government collecting data about them outweigh the benefits" (Pew Research Center, 2019). Cities have the opportunity to craft micromobility regulations and requirements that clearly communicate what data they collect and how they will keep it safe and secure.

This report will explore micromobility regulations in four cities across the United States including Seattle, Washington, Chicago, Illinois, Austin, Texas, and Miami, Florida. The purpose of this study is to understand how each city addresses the issues of equity and data privacy within their regulations and requirements in order to distill key observations for other regulators as they craft their own micromobility policies and vendor requirements. In Seattle, the transportation department conducted a lengthy three-part public engagement campaign before starting a year-long e-scooter pilot program. It

also has the most established citywide data privacy program in the United States. In Austin, regulators and policy makers were bombarded by the unannounced launch of micromobility providers in 2017 and had to work backwards to quickly set up a framework for regulation and enforcement across the entire city. Chicago's transportation department focused a micromobility pilot program in a 50 square mile area with two "equity zones" and experimented with dynamic fleet caps, in order to incentivize more rides in low-income areas. In Miami, city officials launched a pilot program geographically bound to one commissioner district. After the pilot was up and running, regulators decided to discontinue use of MDS when journalists and the public raised privacy concerns over real-time data collection. Taken together, these cases illustrate a wide range of micromobility regulatory approaches used to impact system equity and data privacy.

Chapter 2: Micromobility Regulations in Seattle, Washington

Seattle was one of the first American cities to adopt meaningful regulations governing dockless bikeshare companies in 2017 (Lloyd, 2017). Using two years of experience managing a dockless bikeshare service, Seattle is planning to begin a pilot program for dockless e-scooters in June 2020. The transportation department, with direction from Mayor Durkan, have decided to go through a three-phase public engagement process and pilot program before welcoming scooters permanently onto Seattle streets. In contrast, other Washingtonian cities such as Tacoma, Bothell, Everett, and Spokane and have been quick to adopt e-scooters.

In public remarks, Seattle Mayor, Elizabeth Durkan, has cited concerns around the areas of: detracting from the existing bike share program, safety concerns and indemnification, and equity and accessibility as it relates to e-scooters (Durkan, 2019). In 2018, Seattle's bikeshare system, a dockless system with about 7,000 vehicles in operation, garnered over 2.1 million unique trips, and the city is looking to provide a complementary new mobility service to this popular program, not a replacement. In cities which adopted dockless e-scooters early, scooter-related injuries became an area of concern. Many cities such as Austin, TX saw an increase in emergency room visits due to scooter adoption and there have been many studies conducted regarding e-scooter use and public health. Although the Mayor was not specific in her remarks for how Seattle plans

to mitigate these safety risks with their pilot program, she cited them as a concern and area of study and focus for the transportation department (Durkan, 2019).

Seattle was an early adopter of dockless bikeshare in 2017 and has relevant experience in regulating a new micromobility mode similar to that of e-scooters. Seattle's approach to regulating micromobility is detailed in a number of planning and permitting documents and city ordinances. The vision, goals, and strategies for micromobility in the city come from its "New Mobility Playbook," published in 2017, and its "Free-Floating Bike Share Program Permit Requirements" document, published in November, 2018.

EQUITY

SDOT impacts the equitable distribution of the benefits and burdens of micromobility services among different populations by issuing regulations regarding parking and rebalancing and pricing and payment options. Parking and rebalancing requirements can increase equitable access to sidewalks and public transportation stops and stations by helping to keep them clear of micromobility vehicles. Obstructed sidewalks place more of a burden on populations with ambulatory, visual, and auditory challenges because it is more difficult for these individuals to navigate an obstruction. Thus, regulations or incentives aimed at reducing the number of dangerously parked devices can keep the sidewalk clear for some of the communities most vulnerable residents.

In Seattle, micromobility vendors must update SDOT monthly on their progress in implementing commitments and strategies related to "parking and fleet management"

(Seattle Department of Transportation, 2018). Riders cannot park devices in pedestrian clear zones, on corners, at transit stops, or in loading or disabled parking zones. Under current regulations dockless cycles can either “self-lock” mean the rear wheel locks to prevent the vehicle from moving or cycles can lock to a fixed object such as a bike rack.

SDOT has created a compliance auditing system to ensure compliance with permit terms, including parking and rebalancing regulations. For example, no more than 30% of devices may be improperly parked and no more than 3% of devices can be an obstruction hazard. Seattle is devoting an undisclosed portion of revenues from permitting fees to create designated parking areas in “key spots”. Vendors are able to use these spots for rebalancing and distribution vehicle placement. Vendors cannot park more than 15 devices on a single block, which prevents the likelihood of users parking in a restricted zone due to overcrowding.

Seattle is also devoting $50,000 from permit fee revenue to partner with existing floating bike share providers to increase “adaptive cycling” access. Adaptive cycling refers to bicycle-like vehicles that have two or more wheels like tricycles, hand-pedaled cycles, and recumbent cycles (Seattle Department of Transportation, 2018). Seattle is also incentivizing operators to deploy adaptive cycles as part of their free-floating fleets by giving them permit application preference and a bonus of up to 1,000 extra devices able to be deployed by the company on city streets.

Further, SDOT has identified three geographic areas of the city that exhibit transportation disadvantage, and it requires that vendors make at least 10% of their

devices available in these areas. This promotes equity by encouraging the vendors to provide service to areas with lower levels of mobility and access to other forms of transportation. Additionally, vendors must submit and implement a "reduced fare program" and make alternative rental methods available for riders who do not have a smartphone or bank account.

Vendors must update the city monthly on their progress in implementing commitments and strategies related to "rider education" and "equity" (Seattle Department of Transportation, 2018). Marketing documents should be available in eight languages, and vendors are required to distribute a rider survey at least once during the permit cycle in order to garner feedback from riders. According the requirement the vendor will share the survey results with SDOT, but they not required to publish the results publicly.

MOBILITY DATA AND USER PRIVACY

In order to qualify for an operating permit, vendors must keep track of their deployed devices by a unique identification number and a GPS tracking unit. They also report real-time data to either the city directly, or a third-party data analyst on deployments, removals, and available devices. Specific trip data is reported on a weekly basis, not in real-time. Seattle DOT will use this trip data to prioritize bicycle infrastructure improvements and measure intersection level of service for bicycles. The city has published a document called "City of Seattle Mobility Data Privacy and Handling Guidelines" which provides more details on their approach to data privacy than the permit requirements or city ordinances. The guidelines require vendors to comply

with the Mobility Data Specification (MDS), while also stating that SDOT "recognizes that there are inherent privacy risks associated with collection of trip location data, which when combined with other publicly available data, can be used to identify individuals making the trips" (City of Seattle, 2019). SDOT's data protection standards apply to data reported by operators through MDS. The four standards include:

- Transparency and Accountability—users will be informed what data is collected, how it will be used by the agency, and how long it will be retained.
- Data Categorization and Security—trip data is classified as "sensitive", therefore special security and access controls are applied to the data.
- Data Minimization—trip data collection is limited to origin and destination locations and SDOT does not access real-time data, only queries run once per day.
- Data Sharing and Access Limitations—limit access to staff trained in data handling. Law enforcement or other state agencies will not have access to raw trip data unless required in the instance of a court order, subpoena, Public Record Request, or other legal process (City of Seattle, 2019).

This highly detailed, transparent approach taken by Seattle is unique among most American cities. As a city, Seattle has been very proactive around issues of data collection and data privacy, beginning a citywide privacy program in 2015, two years

before welcoming dockless bikeshare vendors into the city in 2017. The city's focus on data privacy before dockless mobility companies began operating in the city, made it easier for them to adapt and safely handle the geolocation and other sensitive data that these vehicles produce.

Seattle is a leader in data privacy on the municipal level. In 2014, community advocates and the city council recognized the need to make privacy a key value as the city invested in new "Smart City" technologies and began to collect data to quantify how citizens were using public space and public infrastructure. The city council and mayor came together to address data privacy risks and build trust with their constituents by hiring a Chief Privacy Officer and create a Privacy Advisory Committee. The committee, made up of stakeholders from business, journalism, activist groups, cyber security firms, and Washington University faculty, collaborated with city staff to craft a set of privacy principles. The principles include: We value your privacy, we collect and keep only what we need, how we use your information, we are accountable, how we share your information, and accuracy is important (City of Seattle Department of Information Technology, 2015). In their article, *Four Reasons Why AICP Needs on Open Data Ethic*, authors Lisa Schweitzer and Nader Afzalan discuss the need for cities to "enable residents in their ability to scrutinize, understand, and challenge managerial algorithms that have become prevalent in e-government" (Schwietzer, 2017). These authors would likely approve of Seattle's inclusion of community voices into their development of data privacy principles at the city level, however they would likely push the city for further

opening their data resources to the average citizen. Still more cities could heed Schweitzer's call and Seattle's example of including and empowering citizens to know their rights to data privacy and to give them rights to view the data and the tools to help them understand and analyze it.

These steps towards increased data privacy and security were taken well before dockless devices had been proposed in Seattle. Once the principles were created, the city council and mayor adopted them in a city ordinance and designated resources to operationalize them across 38 departments of Seattle's city government. The 2016 city budget allocated over $500,000 for implementation of the privacy program and hiring of the Chief Privacy Officer (City of Seattle Department of Information Technology. The privacy team performs risk analysis, consultation, and work with all city departments to mitigate privacy risk. The office of privacy has been integrated into all purchasing, project management, and program development activities. The keys to Seattle's success in implementing and operationalizing these privacy principles has been interdisciplinary team building, allocating significant resources towards this effort, and creating a culture of data privacy and security with ambassadors who work in each department. They create accountability and transparency by informing citizens what data they collect and issuing quarterly reports which communicate their progress towards living out the privacy principles.

Chapter 3: Micromobility Regulations in Chicago, Illinois

The City of Chicago has taken a cautious approach when it comes to introducing micromobility options into their transportation network. In contrast, other American cities such as Austin, Texas or Santa Monica, California, initially allowed dockless e-scooter and dockless e-bike vendors to operate unfettered and unregulated. The Chicago Business Affairs and Consumer Protection Department (BACP) partnered with the Chicago Department of Transportation (CDOT) to design a time-limited pilot program to test how this new mode would be received by residents before making any commitment to allow dockless micromobility vehicles to be permitted to operate within the city's right of way. The pilot took place from June 15 to October 15 in 2019 in Chicago's west and northwest side neighborhoods.

City officials expressed interest in new micromobility modes for their potential to further the city's goals of "increasing equitable neighborhood access to safe and affordable transportation options" and "lowering congestion and emissions" (Lightfoot, 2020). During the pilot program ten companies including Bird, Bolt, grüve, JUMP, Lime, Lyft, Sherpa, Spin, VeroRide and Wheels were issued permits to operate 250 e-scooters each in a specified 50 square mile area. This area was chosen in order to test how scooters were used by riders in a diverse set of neighborhoods, with populations containing different races, ages, land uses, and densities. The neighborhoods were also diverse in terms of the number of transportation options available, with some well served

by Chicago Transit Authority (buses and trains), Metra (commuter rail), and Divvy (docked bikeshare), and others not well served by those services.

EQUITY

When considering the relationship between equity and e-scooters, operations practices and norms, executed by the vendors, are a significant factor. Specifically, rebalancing practices and regulations as well as parking practices and regulations effects who has access to mobility via e-scooter and how the benefits and burdens of micromobility are distributed among different populations and groups. During the Chicago pilot program, CDOT required that at least 25 percent of all e-scooters were distributed before 5:00am each day in two designated priority areas, accounting for 50 percent of each vendor's total fleet. The north and south priority areas, as shown in the map above, were chosen because they were not well served by the existing docked bike share system (Wisniewski,2019). CDOT's scooter pilot evaluation, however, revealed that none of the ten vendors fulfilled the 25 percent requirement throughout the duration of the pilot program. The evaluation also posited that if these requirements had not been in place, the priority areas would have likely seen very low availability of devices. The pilot evaluation also tracked scooter location data, which showed that as the day progressed, fewer and fewer scooters were available in the priority areas as most moved east towards downtown so that at peak evening travel times very few scooters were available in the priority areas.

This exposes the operational limits of the vendors who were unable or unwilling to expend resources to rebalance vehicles for peak travel times in priority areas, identified by the city based on mobility need. It also exposes the inherent tension between a for-profit micromobility business model and the city's stated goal of expanding mobility for populations underserved by other modes. The city can continue to make regulations and attempt to enforce them, however micromobility companies will always default to serve areas where they can achieve more rides to garner more revenue despite the city's goals or desires. The micromobility companies, whose business models have largely been subsidized by venture capital funds, have been widely criticized for a unit-economics structure that does not bring in enough revenue to cover expenditures (Hawkins, 2019) (Korus, 2019) (Griswald, 2019). As time goes on, investors will come to expect the shared micromobility companies to become profitable, which will either force them to hold prices steady while introducing technological or hardware breakthroughs, which brings down the cost of producing, maintaining, and distributing scooters or they will have to raise prices on consumers. If the companies must raise prices and are under pressure to produce more revenue, they will likely push back against city regulations which require them to operate in "priority zones." This presents a challenge for the partnership between cities and operators moving forward.

Parking practices also have an impact on equity. Many cities have reported that improper parking of dockless micromobility vehicles is their biggest challenge when it comes to accommodating them onto city streets. They also report that parking is the

aspect of micromobility that is most complained about by city residents. In Chicago, regulators attempted to get ahead of this challenge by issuing clear parking requirements, which forbid riders from blocking sidewalks or transit stops when parking e-scooters and e-bikes. While these regulations were beneficial and kept the pedestrian right-of-way somewhat clear, it is impossible to enforce in real-time due to limitations on city resources and capacity for enforcement and so there were some obstructions. Sidewalk obstruction is an equity issue because it affects some sidewalk users more than others. Those with ambulatory disabilities who require a wheelchair, for instance, will have a harder time navigating a blocked sidewalk than an abled bodied person would. In this way the negative burden produced by an e-scooter blocking the sidewalk is unequally distributed, with more burden being shouldered by elderly people and those with ambulatory or vision disabilities, who depend on a clear sidewalk to move about the city.

Another regulation that CDOT instituted in efforts to limit the challenge of the blocked right of way, was that each night scooters had to be collected by 10PM and redistributed by 5AM the next morning. Therefore, even if a scooter was left in a dangerous area for a while after it was used during the day, it was required to be repositioned into an approved parking area by the next morning by the vendor, thus minimizing the amount of time it was blocking a sidewalk and eliminating scenarios which occurred in other cities where scooters were left blocking the sidewalk or discarded on private property or in street gutters for multiple days. In many cities rebalancing protocols are not required or enforced. Even with these regulatory efforts in

place to prevent sidewalks from being blocked, 28 percent of Chicago area survey respondents indicated that e-scooters and their placement on the sidewalk had been a source of inconvenience (Lightfoot, 2020). Furthermore, 52 percent of survey respondents with disabilities (vision, hearing, cognitive, ambulatory) reported shared e-scooters were a source of inconvenience (Lightfoot, 2020).

Scooters being ridden illegally on the sidewalk was also a problem during the pilot program, one that adversely affecting the disabled population, especially those with visual impairments. While the city did require scooters to come equipped with bike bells, users rarely used these features. The National Federation for the Blind recommended a possible solution for this, in addition for more enforcement for those riding illegally on the sidewalk, could be to require e-scooters to emit a low-level noise to alert people who are blind or visually impaired (Lightfoot, 2020).

The physical form and design of e-scooters and e-bikes make them inaccessible for some users. CDOT does not address this issue in its regulations or ordinances pertaining to micromobility. In contrast, Seattle has devoted a portion of the fees collected from dockless bikeshare permitting to go towards tricycles and hand peddle bikes to increase accessibility for some disabled residents. The same strategy could be employed in Chicago to increase accessibility to new micromobility modes.

The Chicago pilot required e-scooter vendors to provide methods of payment to those who did not have access to a smartphone and to individuals who do not have access to credit or debit cards. Each of the ten vendors submitted a plan to the city for how they

would provide a payment system for the unbanked population. Some companies provided pre-paid debit or gift cards, while other companies had benefits programs that individuals could enroll in. During the pilot phase, the companies were required to submit payment method data with each trip so that trips taken by the unbanked population could be tracked. At the end of the pilot less than half of one percent of all scooter trips were taken by the unbanked population. This might suggest that the benefit of mobility provided by access to scooters was not equitably distributed among Chicagoans with varying income levels, with wealthier individuals having more and easier access to rides and lower income individuals having less access. However, it may also suggest that low income, unbanked residents have less demand for e-scooter trips. More investigation is needed to determine the relationship between income-level and mode choice or travel behavior in order to draw a more solid conclusion. It may be the case that more requirements regarding alternative payment methods and the marketing of those methods could produce a greater number of unbanked individuals who use micromobility services.

MOBILITY DATA

Chicago required vendors to share data with the city utilizing both the General Bikeshare Feed Specification, a standardized data format used by most traditional docked and dockless bike share systems, and the Mobility Data Specification standards. In the program evaluation, the BACP rationalizes the collection of mobility data by indicating that since private mobility providers already collect and maintain detailed data for their business purposes, BACP has the right to this data “for the public’s benefit”. They

provide some potential use cases for the data collected such as ensuring customer protection, public safety, easing congestion, addressing mobility inequities, and studying how the city's transportation network is used (Lightfoot, 2020). During the pilot, the regulating agencies had some challenges related to data accuracy and enforcing the data standards set in the pilot requirements. Ultimately, they were forced to issue seven citations to six companies for failing to submit accurate data. Chicago required more data from companies than are required in the MDS standards. For example, it required public data feeds using GBFS to show real-time locations of scooters available for rent and compiled these into one app that the public could use to view available scooters across all vendors. However, trip planning and payment occurred in the vendors proprietary apps. The City of Chicago does not address data privacy or data security protocols directly in the evaluation or in the city ordinances governing e-scooters. It is unclear what privacy principles or values the CDOT and BACP adhere to. There is not transparency about how data is stored or about the techniques the agencies use to keep or maintain the data. It is also unclear how long the data collected is maintained and what specific use the city has for the data it collects. Illinois does not have any state laws governing geolocation data collection for companies or for public agencies.

CDOT also provides scooter data to the public through the Chicago open data portal located at data.cityofchicago.org. It uses three different aggregation techniques to aggregate and anonymize trip data in order to protect the privacy of scooter riders including aggregation over time, aggregation by geography and aggregation by trip

density. Aggregation over time means the timestamps for each trip are rounded to the nearest 15-minute interval. Aggregation by geography means the origin and destination of each ride are displayed as census tract numbers. Aggregation by trip density means that data for a trip is only shown when three or more distinct trips occur from the same origin and destination census tract at the same time interval (Bird, 2020).

Chapter 4: Micromobility Regulations in Austin, Texas

In contrast to both Seattle and Chicago, e-scooters launched in Austin, Texas on April 16, 2018 without notice to the Austin Transportation Department (ATD) or other city officials. Bird launched with nearly 700 devices and Lime followed with several hundred of their own. Local elected officials were inundated with questions and complaints from their constituents and with no regulatory framework in place, city staff scrambled to draft policies and keep city streets safe. A few days later the City Council approved a fast-tracked ordinance which prohibited dockless scooters and bikes operating on city streets until a formal permitting process is established. Eventually ATD granted operating licenses to five "micromobility operators" including Bird, JUMP, Lime, Spin, Wheels, and Revel as well as three "shared vehicle services" including Revel, Scoot, and Zipcar (City of Austin, 2020). The regulations for micromobility vendors operating in Austin are published by ATD in its "Director Rules for Deployment and Operation Of Shared Small Vehicle Mobility Systems" document (City of Austin Transportation Department, 2018).

EQUITY

When surveyed by ATD before the e-scooter launch, Austin residents identified as a priority increasing transportation access for populations that experience low accessibility with other modes such as docked bike share, public transportation, walking,

and biking. Nonetheless, few provisions in the city ordinance or permitting requirements addressed this concern. The city allowed vendors to place scooters anywhere within the city limits, thus allowing the companies to create operating zones without consideration to equity or access. The rules for dockless units did include a provision which stated that vendors must submit a plan for serving "underserved areas" that initially contained less than 25 micromobility units per square mile (City of Austin Transportation Department, 2018).

Companies such as Bird, Jump, Lyft, and Ojo have various discount rider programs for low income residents who wish to use their services. ATD required vendors to submit and implement a plan "offering an affordable option that does not require the user to access the service via a smartphone application for any customer with an income level at or below 200% of the federal poverty guidelines" (City of Austin Transportation Department, 2018). The regulation also states that vendors are to submit a plan for how they will market and communicate the affordable option. This provision recognizes that low income residents do not have equal access to micromobility options and requires companies to take steps to make their services more accessible to low income residents. However, it is unclear if there is any penalty for vendors if they do not submit a plan or submit a plan but do not implement it.

The unbanked population is not well-served by micromobility vendors—it is not clearly advertised where or how to purchase access to micromobility services if smartphone and computer access is limited. Each vendor offers different options and

qualifications for those who can use its services without a debit or credit card, making for a confusing user experience. Austin's parking and rebalancing protocols have implications for the equity of micromobility services—that is—the benefits and burdens shared micromobility options bring, impact certain populations in different ways. Parking policy is especially key here because improperly parked e-scooters place a disproportionate burden on those with ambulatory, auditory, and visual disabilities. In Austin, scooters are cannot be parked in restricted areas such as ADA accommodations, sidewalk cafés, transit zones, loading zones, disabled parking zones, street furniture, entryways, driveways or alleys, crosswalks, fire hydrants, drinking fountains, public art, informational signs, bikeshare stations, parks, or sidewalks four feet or less in length (City of Austin Transportation Department, 2018). In addition to providing restricted parking areas, Austin regulations reference the installation of parking boxes for micromobility fleets, and that vendors will assume 5 percent of costs of new parking infrastructure.

Austin also has a provision which states that an unused or broken e-scooter must be picked up within 48 hours of detection. Austin does not have a regulation that stipulates quotas or time limits for fleet rebalancing. Nightly fleet rebalancing is important because it enforces the companies to make sure each device is not left in an unsafe area overnight. Fleet rebalancing time requirements affect equity in two ways. First, this practice ensures that once scooters are used throughout the day, they will be returned to staging areas that ensure a greater distribution throughout the city, especially

if that city has requirements or goals around placing scooters in areas with fewer mobility options. Operators are more likely to hit targets associated with equity zones or priority areas if they must pick up and rebalance the whole fleet once every 24 hours. Second, it increases the likelihood that scooters parked unsafely in restricted areas will be removed more quickly, within at least 24 hours. This affects equity because individuals with ambulatory, visual, auditory, and other disabilities are more burdened by sidewalk or transit stop obstructions than able bodied individuals.

MOBILITY DATA

The City of Austin conducted six preliminary public outreach events before e-scooters launched in Austin in order to gauge public interest and comments, questions, and concerns of community members. Throughout the six events 122 people attended and participated in a survey regarding a number of issues related to micromobility in their community such as safety, access to transportation, advantages and disadvantages of the new mode, and other such questions. Importantly, when asked "What do you think are the potential disadvantages of dockless bike and scooter share?", more respondents identified "privacy/data breach/harmful data sharing" than any other potential disadvantage (Austin Transportation Department, 2018). This survey response demonstrates why city agencies and private micromobility service providers should be more transparent, upfront, and clear about what their privacy principles are, in addition to how they will use the data they collect from customers and residents. The city responded to the data privacy concerns citizens voiced by inserting statements about data privacy

and security into their rules for operating shared small vehicle mobility systems and codified in the City Code. The rules contain a section entitled “Privacy, Data Reporting and Sharing” which include restrictions on using riders’ location data when the vendor app is not in use, opt-in for data sharing with third parties, and user-facing notification of change in terms of service immediately upon adoption (City of Austin Transportation Department, 2018). The fact that ATD has addressed privacy concerns within their operating requirements for vendors is a good practice. However, it does not reference or relate back to a city-wide data privacy principles, policies, or initiatives.

The city ordinance requires the vendor to supply the city with real-time and historical data from their fleet through a web-based application programming interface (API) and requires data to be sent “to the most current Director authorized specifications in a manner that protects individual user privacy/” This is vague and does not explicitly state what data the vendors will report to the agency, nor does it state whether the Mobility Data Specification will be used or another specification.

Chapter 5: Micromobility Regulations in Miami, Florida

In April 2018 two scooter operators (Bird and Lime) blanketed Miami with electric scooters. By the end of the month, city attorneys issued cease and desist letters and both operators pulled out (Wile, 2018). In October 2018, a pilot plan sponsored by city commissioner Ken Russell was approved that allowed six companies including Bird, Bolt, Jump, Lime, Lyft and Spin; Baus, Helbiz, and Wheelz to pay $50,000 to apply for a license to deploy 50 scooters each (Wile, 2018). The pilot allowed use of dockless electric scooters only in Miami's second district (Ken Russel's district), which includes downtown, Coconut Grove, Edgewater, and Brickell neighborhoods. The city monitored ridership data and based on demand, allowed companies to add up to 100 scooters every two weeks, and later, allowed them to increase their fleets by 25% if ridership data indicated increased demand, or they could decrease them if they saw a decrease in demand. In addition to the $50,000 permit fee, companies were required to pay the city $1 per scooter per day (Poblete, 2020). Additional regulations included that riders must be at least 18 years old; scooters must be left upright and not blocking rights of way; scooters must be left only on public property unless operators reach agreements with owners of private property. The six-month pilot began in April 2019 and in September, city commissioners extended it until the end of 2019 and then until May 2020, when the city planned to put out a request for proposals that would have scooter companies compete against each other to operate in the city following the pilot; Russell predicted that three to four operators would remain. Metrics that would be used to determine which

companies would be allowed to operate include “safety, size of fleet, and ability to incentivize good behavior” (Kapnick, 2020).

EQUITY

The city of Miami did not identify particular equity zones within their micromobility pilot zone in Commission District 2. In the ordinance regulating the micromobility pilot program, Miami did not identify equity as a key goal or concern, however it did require vendors to submit a marketing and community outreach plan “to promote the use of motorized scooters, particularly in low-income areas” (City of Miami, 2019). The effectiveness of this regulation might be improved by providing a specific threshold or definition for “low-income” and suggesting particular strategies to improve access for the target population. The city did not require vendors to provide alternative payment options for residents who do not have access to credit or debit cards or to smartphones.

Miami requires vendors to rebalance the scooters at least every 24 hours. This policy ensures that devices begin each day in areas that do not obstruct sidewalks. This provides more equitable access to the sidewalk network, especially for those with disabilities, who may have more trouble navigating an obstruction than an able-bodied individual. The city of Miami does, however, allow e-scooters to operate on sidewalks at a speed of 7 miles per hour. Even at this lower speed, operating e-scooters on sidewalks increases the likelihood of scooter-pedestrian crashes, poses a safety hazard for pedestrians and scooter users. This risk is experienced at a greater level by pedestrians

with auditory and visual impairments, who may not be able to detect an approaching scooter. The ordinance could achieve more equitable safety outcomes by requiring scooters to operate in the street or bike lane, clear of pedestrians, and requiring them to come equipped with a bell so that riders could signal their approach to others using public facilities such as sidewalks, bike lanes, and shared use paths.

MOBILITY DATA

Initially, Miami required vendors to submit real-time geolocation data in the Mobility Data Specification (MDS) format, however after receiving pushback from vendors Uber and Lyft, who raised data privacy concerns about sharing sensitive customer information, the city removed those requirements from the permitting rules document. This outcome was likely influenced by other events, which sparked controversy around data privacy and surveillance in Miami a few days before the scooter permitting documents were reviewed. Privacy advocates had criticized the city for considering installation of utility poles with cameras and license plate readers without outlining use cases for collecting this data (Rivero, 2019). This series of events demonstrates the importance of clear principles, policies, and procedures for data privacy and security within local governments and managing agencies.

Chapter 6: Discussion

Each city's approach to addressing equity and data privacy in their ordinances and permitting requirements emphasized different elements and strategies. Table 1 offers an at-a-glance comparison of how cities addressed general operations, equity issues and data privacy issues in their regulations. This section highlights some key patterns and themes related to equity and data privacy which are evident in the table and discusses some possible implications for cities seeking to improve their micromobility governance strategies and practices.

Table 1: Micromobility regulations in Seattle, Chicago, Austin, and Miami.

	Seattle	**Chicago**	**Austin**	**Miami**
General operations				
Micromobility program manager	Seattle Department of Transportation (SDOT)	Chicago Business Affairs and Consumer Protection Department (BACP) and Chicago Department of Transportation (CDOT)	Austin Transportation Department (ATD)	Miami Parking Authority (MPA)
Operating area	Seattle city limits	Pilot Area (Halsted St. and the Chicago River on the east, Irving Park Rd. on the north, the City boundary and Harlem Ave. on the west, Chicago	Austin city limits	Council District 2 (Coconut Grove, Brickell, Downtown Miami, Midtown, Edgewater,

Table 1: continued.

		River on the south; 50m2)		Morningside, and Wynwood)
Permit fee required	$250k and $50 per device	$120 per scooter	$100 per vehicle	$50,000 non-refundable and $1 per dockless units per day
Cap on permit #	5,000	250 (during pilot phase)	500	300 (during pilot phase)
Cap on total units	20,000	3,500	No cap	No cap
Trips/day minimum	None	None	2 (avg.) per active vehicle	2 (avg.) per active vehicle
Insurance required	Commercial general liability insurance: $1m per occurrence; $3m in aggregate	Commercial general liability insurance: $5m per occurrence	Business Automobile Liability, single occurrence, $500k; Commercial General Liability, $500k	$2M commercial general liability per occurrence; $5M policy aggregate
Lights/reflector	Working front and rear lights, and a bell.	“always on” front and rear lights visible from 500 feet.	“always on” front and rear lights visible from 500 feet.	none
Speed limit	15mph	15mph	20mph	15 Mph on road/bike lane; 7Mph on sidewalk, bay walk or in park
Response time for fleet reduction	None	2hrs	4hrs (excludes weekends/holidays)	N/A
Removal time for	If reported between 6am and	2hrs	4hrs	N/A

Table 1: continued.

unsafe vehicle	11:59pm, then 2hrs. If reported between midnight and 5:59am, then 4hrs.			
Equity				
Priority zones w/ fleet share quota	At least 10% of vendors devices must be made available in three equity focus areas identified by SDOT	At least 25% of vendor's units located in Priority Zone 1 and 25% in Priority Zone 2 at start of each day	Requires a marketing plan for areas that initially had only 25 dockless units per m^2	No Priority Zones
Rebalancing requirements	Vendors cannot park more than 15 devices on one block	Rebalanced each night after operating hours (10pm)	Vehicle left for more than 48 hrs in one location maybe removed by city	Must be rebalanced at least every 24 hours
Payment options	All persons who qualify for the ORCA Lift reduced-fare program or Regional Reduced Fare Permit, will not pay more than $1.50 per hour; at least one low-barrier rental method available for riders who do not have a smart phone or bank account	Vendors must provide cash payment options and non-smartphone access to service	Submit plan for "affordable option" that does not require smartphone for any customer with income level below 200% of the federal poverty guidelines	N/A
Parks Restriction	Vendors must remove vehicles left at parks unless it has a special agreement with	Vendors must use geofencing to prevent use in parks or on certain greenways or other areas and	Dockless units shall not operate within parks, publicly-accessible plazas, off street	Dockless units can operate in parks

Table 1: continued.

	the agency which manages that particular park	remove vehicles parked in these off-limits areas	parking lots/garages	
Accessibility plan	$50k in revenue used to increase adaptive cycling. Vendors receive a bonus of 1,000 extra units if they deploy adaptive cycles for disabled customers; Equity Plan must be submitted with specific strategies for "communities of color, low-income communities, immigrants and refugee communities, people with disabilities, people experiencing homelessness or housing insecurity; LGTBQ, women, girls, and youth."	Vendors must "address equity issues" by utilizing their scooter service to expand mobility to people facing financial and technological barriers	Marketing and outreach plan for neighborhoods with less than 25 vendor units per square mile	Marketing and Community Outreach plan required, "particularly in low-income communities"
Parking restrictions	Devices cannot be parked in pedestrian zones, on corners, at transit stops, or in loading or disabled parking zones. Devices can "self-lock" or	6ft clearance between the device and all public way encumbrances, not within 10ft of street corners, away from bus stops loading,	ADA accommodations; sidewalk cafes or street patios, transit zones, bus stops, shelters, passenger waiting areas,	Cannot impede sidewalk in a manner reducing sidewalk to less than three feet, cannot

Table 1: continued.

	lock to a bike rack; Cannot reduce pedestrian sidewalk zone to less than 6 ft.; Vendor shall submit a parking management plan. Vendor must have geofencing capability for events management parking scenarios	zones, and building access points	loading zones, disabled parking zone, street furniture, entryways, driveways, sidewalks less that 4 ft, crosswalks, fire hydrants, drinking fountains, public art, any fixed sign, bike share stations, restricted parks	impede vehicle traffic, sidewalk less than 6ft wide, bus stops, fire hydrants, loading zones, railroad tracks, disabled parking zones, street furniture, driveways, entryways
Micromobility specific parking infrastructure	SDOT is allocating a portion of permitting revenues to build designated parking areas for micromobility devices	none	Vendor pays the city for costs associated with installation and maintenance of parking boxes at ratio of 5% of total fleet size	N/A
Improper parking response time	If obstruction reported between 6am and 11:59pm, then 2hrs., if obstruction reported between midnight and 5:59am, then 4 hrs.	2hrs	2 hours default. 60 mins for sidewalk obstruction, bike lane obstruction, and travel lane obstruction	2 hrs.
Parking restrictions penalties	Vendors maintain $10k surety bond which SDOT can	Fleet reduction at discretion of Program Manager	Fleet reduction at discretion of Program	Vehicle impound; $25 ticket

Table 1: continued.

	use to pay costs related to moving or impounding improperly parked units		Manager	
Public engagement strategy	Monthly updates on strategies to address “rider education” and “equity”. Vendors are required to distribute an annual rider survey	Vendors shall implement a marketing and targeted community outreach plan at their own cost by distributing education and outreach materials to communities in the pilot area	6 public engagement events held by the city and multiple user surveys and micromobility perception surveys administered; city requires vendor participation in planned outreach	none
Workforce requirements	none	Vendors are encouraged to hire 30% of their staff from job training placement programs operating in Chicago; encouraged to have contracting goals for minority and women-owned businesses.	None	none
Data				
Reporting requirements	Vendors must report real-time data on deployments, removals, and available devices via the Mobility Data	Vendors must report data using Mobility Data Specification and General Bike Feed Specification; In addition to MDS and GBFS	Real time data required through the Mobility Data Specification: ID, Device ID, Vehicle Type, Trip Duration,	Initially Miami required data through the Mobility Data Specificatio

Table 1: continued.

	Specification; Vendors must report weekly updates of trip data. Waypoint data is used for prioritizing bicycle infrastructure and measuring infrastructure level of service for cyclists; vendors will report a maintenance log and incident log.	vendors submitted monthly data reports for other data not captured in MDS such as customer service request logs and maintenance logs.	Trip Distance, Start Time, End Time, Modified Date, Month, Hour, Day of Week, Council District (Start) Council District (End), Year, Census Tract Start, Census Tract End	n API, however the city discontinued using MDS because of privacy concerns
Data for public use	Seattle releases monthly reports in pdf form with summaries of ridership data compared with past months and years. No trip data (origins/destinations) are included. Program Manager will notify vendor if raw data is released in response to a Public Records Act request.	Aggregated trip data available through the Chicago open data portal at data.cityofchicago.org	Not required in ordinance, but data is available through the city's open data portal: data.austintexas.gov	Data can be published per ordinance, but not available on Miami-Dade Open Data Hub
Storage requirements	Micromobility data is classified "Sensitive" and follows the city's Information Security Data	Not included in ordinance or supporting documents	Vendor must submit a "privacy policy" (not published externally)	Not included in ordinance or supporting documents

Table 1: continued.

	Classification Guidelines for sensitive data.			
Limits on data access / sharing	SDOT and IT dept. limit internal access to pre-approved staff who have been trained on appropriate use and handling of this data to ensure compliance with privacy and security requirements.	CDOT aggregates data shared public with three different techniques: time aggregation, geographic aggregation, and aggregation by trip density.	Vendor must submit a "privacy policy" (not published externally)	Not included in ordinance or supporting documents
Limits on data collected	SDOT only collects information required to deliver and manage City services and programs, and keep it as long as legally required.	Not included in ordinance or supporting documents	Vendors will not require customers to grant location services to use the vendor's mobility service while the mobile application is not in use; vendors shall not require customers to share data with third parties in order to use the dockless mobility service.	Not included in ordinance or supporting documents
Data privacy principles	The city-wide data privacy principles apply to micromobility data: We value your privacy; We collect and keep	None	None	none

Table 1: continued.

	only what we need; How we use your information; We are accountable; How we share your information; Accuracy is important			
Data privacy plan/ policy	Clear policy is outlined in a public document entitled "City of Seattle Mobility Data Privacy and Handling Guidelines" which describes the following data protection standards: Transparency and Accountability, Data Categorization and Security, Data Minimization, and Data Sharing and Access Limitations.	None	Vendor will implement and submit a privacy policy that safeguards users personal, financial, and travel information.	Not included in ordinance or supporting documents
Complaint history report	SDOT requires a "Parking Summary" monthly report including number of reports the vendor received regarding parking obstructions, outcomes of the reports, and	Companies were required monthly to submit two data sets containing customer reports and maintenance requests.	Required monthly	Not included in ordinance or supporting documents

Table 1: continued.

	response time.			

COMPARATIVE ANALYSIS OF EQUITY REGULATIONS

Policies aimed at increasing equity typically focus on the equal distribution of benefits and burdens of a particular service among different groups, populations, or communities. In the realm of micromobility, some of the benefits include: increased mobility, increased accessibility, and increased employment opportunities brought by new vendors. In this context, mobility refers to the ability of a person to move from place to place and accessibility refers to the ease to enter, reach and use a service or opportunity. Some of the burdens of micromobility services include: potential obstruction of sidewalks or other spaces in the public right of way. In Seattle, Chicago, Austin, and Miami local governments include a number of regulatory policies and requirements in order to more equally distribute the benefits and burdens discussed above. Some of those regulations include equity zones, rebalancing and parking policies, reduced or alternative payment plans, and workforce incentives.

Of the four focus cities, Seattle, Chicago, and Austin identify priority zones, where they require vendors to provide service to underserved areas. Seattle and Chicago clearly define geographic boundaries for their priority zones and mandate that a vendor launch a particular percentage of its active fleet in these zones. SDOT requires at least 10% of vendors devices are required to be made available in the three equity focus areas they identified. In Chicago, at least 50 percent of a vendor's active fleet must be available in the two equity focus areas the program manager identified. In both Seattle and

Chicago, vendors are incentivized to reach their device deployment targets in equity zones by receiving permits for additional devices in areas of their choosing. In Austin, the regulations require a marketing plan for areas that initially had only 25 dockless devices per square mile. Austin's Guidelines could have been improved by defining priority areas using other factors such as service levels of other transportation options in the area such as access to frequent bus service, access to docked bike share, access to sidewalk infrastructure, and access to bike lanes. Other attributes to consider in the definition of "underserved neighborhoods" might include historical factors of local investment or disinvestment by local government programs or social services, the racial demographics of the neighborhood, or average income level. Provisions which incorporate these factors would allow for more equitable access to micromobility options in areas of the city which have historically received inadequate and unequal services.

The policies in Seattle and Chicago employ an incentive structure similar to that of density bonus programs, which allows real estate developers "to increase the maximum allowable development on a property in exchange for helping the community achieve public policy goals" (Center for Land Use Education, 2005). With this incentive structure, well-crafted regulations encourage vendors to increase deployment in equity zones and help cities reach their goals of increasing mobility and accessibility in underserved areas in exchange for more deployments in high-use, high-revenue-generating areas.

Each city used parking policies to mitigate the burdens of sidewalk obstructions for residents with ambulatory, auditory, visual, and other disabilities, who are impacted more than able bodied residents by sidewalk obstructions. Each city had similar parking restrictions with some variation among how much space was necessary to leave on the sidewalk when parking an e-scooter. Seattle and Chicago required 6 feet of clearance, while Austin required 4 feet and Miami required 3feet. Only SDOT and ATD committed to installing parking boxes designated for micromobility use. It stands to reason that more designated parking areas would lead to less parking obstruction violations, however more empirical studies of dockless e-scooter parking patterns is needed to fully understand the relationship between marked parking and parking obstructions. There are a few possible strategies that vendors might use in order to incentivize better parking behavior from riders. For example, vendors could issue a notification through the app when a user is attempting to park a vehicle in a restricted area, or reward riders with free credits or free rides after four safe parking instances.

Each city required an average two-hour response time for dangerous parking remediation, with Austin requiring a 60-minute response time if sidewalks were blocked. Cities also varied in their rebalancing requirements. Rebalancing is the practice of moving devices from an area of low demand to an area of higher demand. Chicago and Miami require rebalancing every 24 hours, while Austin requires rebalancing every 48 hours. Seattle does not have a time requirement but requires no more than 15 devices can occupy a single block at any time, in order to keep their system balanced. Rebalancing

scooters not only provides vendors the chance to distribute their fleet with more spatial equity in order to better serve underserved populations, but it also ensures that even if the improper parking 2-hour response time is not met, any devices obstructing sidewalks will at least be moved every 24 or 48 hours.

Another way cities seek to increase access to micromobility services, particularly among low income users, is by requiring vendors to offer cash payment options for those who lack access to a smart phone or debit or credit cards. All cities except Miami included cash payment option requirements in their regulations. Discounted rates are also an option for increasing access to micromobility options for low-income residents. Seattle stipulated that residents who qualified for the county-run ORCA Lift reduced-fare program or the Regional Reduced Fare Permit program should not pay more than $1.50 per hour for dockless service. Austin required the micromobility vendors to submit a plan for an "affordable option" for customers with an income level below 200 percent of the federal poverty guidelines.

These measures make dockless mobility services more accessible for low-income residents. One issue with these requirements is that it can be difficult to get the word out about these reduced fare and alternative payment methods to residents who need it most. Also, each vendor may have different definitions for what they consider "low income." Austin strengthened its regulation here by adding a threshold and defining low income in the ordinance for all vendors. Similarly, Seattle's reduced fare policy avoid confusion by using the same threshold as preexisting public transit reduced fare programs. The strategy

of adopting pre-existing reduced fare qualifications from similar social services may increase the number of low-income residents who use micromobility options, especially if the same account number, access key, or phone number can be used for both transit and micromobility discounted services.

Austin's requirement for the vendor to submit a plan for marketing to low-income residents could be improved. The provision would be strengthened by requiring a recurring report that included aggregated income information about its customers so the city could monitor how many low-income residents the vendor was serving. If the city had access to this income information, then they could implement an incentive program in order to encourage the vendors to serve more low-income residents. For example, if a vendor reports 15 percent of total rides taken by low income users, then the city could allow the company to deploy vehicles above the 500-unit cap.

Chicago included a section regarding workforce and hiring in their regulatory framework which encouraged vendors to hire 30 percent of their local operations staff from existing job training placement programs operating in Chicago and to submit and implement goals related to contracting minority and women-owned businesses. Equity among race, class, and gender with regard to hiring practices and contracted services is another way to provide more parity in the distribution of benefits available from micromobility companies launching in new markets. It is common for cities to maintain minority-owned business enterprise and women-owned business enterprise programs which encourage minority and women owned businesses to receive city contracts by

establishing special procurement goals based on race and gender. Cities could institute similar programs and policies to encourage equitable hiring practices by micromobility companies. Although the Chicago workforce policy was optional, they could require it in the full launch, after the pilot program.

COMPARATIVE ANALYSIS OF DATA PRIVACY REGULATIONS

Examining and comparing the case study cities' requirements and regulations pertaining to data management and data privacy exposed some significant commonalties and some differences. First, each city, at least initially, adopted the Mobility Data Specification (MDS). Second, Seattle had policies and special departments already devoted to data privacy and security that it was able to rely on to better manage the risk associated with collecting and storing geolocation data when dockless devices launched, while other cities did not. And third, Chicago implemented and shared aggregation strategies they use before publishing data on their open data portal, which added a welcome layer of security and transparency.

Seattle, Chicago, Austin, and Miami each initially adopted MDS, an Application Programming Interface (API), developed by Los Angeles Department of Transportation and used to transmit anonymized information about micromobility vehicles and trips from a company such as Lime, Bird, or Jump to a city's active transportation or information technology department for the purpose of regulating the new dockless fleets and for collect travel data for use in long term planning.

Because many cities were initially caught off guard by the rapid introduction of shared dockless devices onto their streets, they quickly adopted LADOT's open source solution, so that they too could track the new devices on their streets. Many cities did so without understanding fully the sensitivity of the data they were collecting. Specific geolocation data is sensitive, personal data and represents an individual's travel patterns. Even though this information is anonymized, when combined with other publicly available data, it is possible to re-identify individuals (de Montjoye, et al, 2013). Many privacy advocacy organizations such as the ACLU and Electronic Frontier Foundation have spoken against MDS, especially real-time trip data collection, stating that it exposes individuals private travel data (Conway, 2018) (Sheard, 2019). These groups argue for more data sharing regulations and for cities to develop stronger privacy programs. As referenced in the Miami case study, the city discontinued its use of MDS after privacy concerns were raised. The city of Miami and the Miami Parking Authority lacked clear protocols for sharing, storing, and anonymizing micromobility data, which caused local media, Miami residents, and micromobility vendors to raise concerns about sharing data with the city. Establishing a citywide framework for data collection, storage, use, and sharing practices before adopting micromobility options will help cities to gain the trust of vendors and citizens. It also decreases the risk that the city will compromise the security of sensitive data.

The cities of Seattle and Chicago both have robust data privacy or information departments, which influenced their micromobility regulations. Both cities, while using

MDS, pivotally did not require real-time trip data, only real time data on parking and obstructions, making their data more secure. Furthermore, Seattle has internal protocols and compliance controls for staff handling data. Access is limited and all staff is trained on privacy and security techniques. Another key lesson from Seattle, is that they publish all of their privacy principles and the steps they take to ensure data safety and security. This transparency helps to quell public concern and concern from the micromobility companies themselves about sharing sensitive data with city governments.

Chicago also provided transparent information about their aggregation methods, which go a few steps beyond MDS does in terms of aggregation. Any data they share is aggregated over time, which means arrival and departure times are rounded to the nearest 15-minute interval. It is also aggregated by geography, which means that trip origins and departures are identified by census tract, not latitude and longitude coordinates, which obscures the exact start and end points of individuals trips. Lastly, Chicago aggregates trip data by trip density, which means a trip is only shared when three or more nearly identical trips are taken. These aggregation methods allow for the public to observe trends on an open data portal without revealing an individual's discrete trip patterns (Bird, 2020). Other cities would be wise to consider these aggregation methods as they continue to share data on open public portals.

Chapter 7: Conclusion

Each case study provided some key insights into how cities can impact equity and data privacy within their micromobility policies and requirements. Geographic equity can be increased by instituting "equity zones" or "priority areas" and by clear fleet rebalancing requirements as exemplified Seattle, Chicago, and Austin. Equity zones are best defined by considering transportation access more broadly, taking into account an area's access to docked bike share, public transportation, bike lanes, sidewalk network, and paratransit. Other social factors such as average income level, race, and historic access to government resources and social services should dictate the boundaries of priority zones as well. Cities can impact geographic equity by pairing the "equity zones" policy with 24-hour rebalancing policies, as implemented in Chicago and Miami. This ensures that the equity zone will be re-supplied with devices at least every 24 hours, improving scooter access in equity zones during peak travel periods.

Regulators can impact social equity by mandating alternative payment methods like Chicago, Seattle, and Austin and instituting smart parking requirements and auditing methods. Seattle and Chicago showed that enforcing parking regulations often requires physical parking audits rather than data audits. Alternative payment method regulations can impact social equity by providing access to micromobility services for individuals who do not have access to credit or debit cards or smartphones. More cities could do more to serve low-income residents by requiring vendors to offer discounted rides for individuals who already qualify for other benefits such as SNAP or social security.

Cities can regulate the sharing of data and improve its own internal data practices in order to protect their citizens' right to privacy. In Seattle, SDOT applied existing data

privacy principals and protocol to their guidelines for data sharing with micromobility vendors. Where transportation officials-in grappling with data privacy issues raise by a micromobility vendor's launch --that their city has no cross-cutting policy or program to address data privacy and security, they can advocate for its creation. Cities can also avoid privacy risk by not collecting trip data in real time, as demonstrated in the Chicago case, and by further aggregating data they share through a public data portal.

The variety of regulations documented in these case studies indicates that there are many ways that city cities can further iterate and experiment with micromobility regulations to pursue their own equity and privacy goals.

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